THE EFFECTS OF HEMI-SYNC® ON ELECTROCORTICAL ACTIVITY-A REVIEW OF THREE EMPIRICAL STUDIES

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Dedication

We wish to dedicate this paper to Robert A. Monroe: a man whose love and compassion for humanity have forever changed and expanded the definition of human consciousness.

Introduction

Bilateral hemispheric synchronization is a phenomenon which has been attracting the attention of researchers and clinicians for sometime. It has been approximately thirty years since a number of studies showed that adept meditators tended to bring about a state of phasic hemispheric synchrony while in deep meditation (see Carrington, 1977). In a classic and often cited study, Banquet (1973) demonstrated that advanced TM meditators could indeed achieve total brain synchrony after minutes of repeating a mantra. However, even in adept meditators the dominant brain-wave frequency in which the state of synchrony takes place is almost impossible to predict and/or control.

Banquet (1973) suggested that during meditation a greater equalization of the functioning of the hemispheres tends to take place. This relative shift in hemispheric dominance (from left-brain dominance to whole-brain dominance) may result in therapeutic effects which are likely to enhance mind-body integration and overall improvements in physical and emotional health. Because of a reduction in cognitive activities during moments of whole brain synchrony, it is believed that negative thinking, self-punitive thoughts and excessive worrying are apt to slow down and consequently a reduction in cognitive anxiety is experienced (Carrington, 1977; Sadigh,1991; Schwartz, Davidson, & Goleman, 1978.)

Delmonte (1984) suggested that creative intelligence requires the synthesis and collaboration of both the analytic and the spatial/intuitive halves of the brain. Again, it appears that this left-brain-right-brain synthesis can be achieved almost at will by adept meditators, especially those who practice TM.

Green and Green (1989) believed that long term biofeedback and relaxation training resulted in a harmonious relationship between the two hemispheres which facilitated control of the autonomic nervous system. This control can especially be helpful in the treatment of a variety of stress related and psychosomatic disorders. The authors also suggested that such states of bilateral synchrony may indeed bring about positive changes in psychophysical health as well

as therapeutic alterations in underlying personality characteristics which may interfere with healthy growth and development.

Ornstein and Thompson (1984) criticized the Western emphasis on intelligence in terms of written or spoken word. They believed that perhaps the reason we have difficulties expanding our standards of education is because of this overemphasis on the potentials and abilities of the analytic/verbal brain. Studies investigating whole-brain synthesis clearly suggest that human knowledge, intelligence, and well being may very well be achieved as the two brains begin to function as one--in unison and in synchrony. Table 1 summarizes some of the documented characteristics of the two hemispheres.

Table 1

LEFT BRAIN	RIGHT BRAIN
Verbal	Visual
Analytic	Perceptual
Cognitive	Affective
NREM sleep	REM sleep
Rational thinking	Intuitive

But how can we achieve whole brain synchrony without needing to become involved in the prolonged practice of meditation and meditative exercises? Can such states be induced and maintained by the use of technology? To answer these questions, let us now turn to the examination of Eastern and Western approaches which attempt to bring about whole-brain integration and synchrony.

From East to West: In Search of The Synchronized Brain

The beneficial effects of hemispheric synchrony suggested in the current literature have motivated a large number of researchers, clinicians, and entrepreneurs to discover more effective and practical ways of inducing such a state. Empirical research with some forms of meditative practices has shown that a synchronized brain state may be achieved after literally years of practice. Furthermore, it has been established that only certain forms of meditation result in such a state. Practices that suggest focused attention such as TM seem to be the most effective ways of causing whole-brain integration. As it was indicated earlier, synchrony achieved during these practices appears to be limited to certain specific frequencies and states of consciousness which cannot be easily controlled or modified by the meditator.

A few years ago, we had the opportunity of mapping the cortical activity of an adept meditator who had been regularly practicing and teaching TM for approximately fifteen years. The subject's EEG activity during baseline showed an asynchronous state throughout the cortex. The primary cortical activity was that of high-frequency Alpha activity combined with some Theta and Beta waves especially concentrated in the left temporal lobe. Once a stable baseline was achieved, the subject was asked to practice his mantra meditation. Shortly after this, the subject's cortical activity began to slow down and signs of phasic-bilateral synchrony became apparent. Within a matter of minutes the subject's primary cortical activity was that of low frequency Alpha across the cortex. This is consistent with similar observations reported in the literature (i.e. Banquet, 1973). After the subject stopped meditating, his cortical activity began to resemble that of the pre-meditation state.

This was actually the first time we witnessed a fully synchronized brain induced by meditation in our neuropsychological laboratory. The results and findings of this experiment were both exciting and sobering. We asked ourselves, "Do we need years of training in meditation before we can achieve whole-brain synchrony? If so, how many years?

In months to follow, by using our computer-analyzed EEG unit, we began testing and experimenting with a variety of equipment, gadgets, tapes, special vibrational sounds, musical notes played on synthesizers, resonating bowls and gongs all of which claimed to entrain the brain into a synchronized, enhanced state. The results of our investigations were at best disappointing. Study after study, such devices and sounds failed to result even in a slight movement in the direction of hemispheric synchronization or enhancement of any brain-wave frequencies.

In the early months of 1989, we began studying the effects of a specialized audio technology, known as Hemi-Sync, which purported to bring about hemispheric synchronization by inducing a Frequency-Following Response within the brain (Monroe,1982). Unlike other modalities tested so far, Hemi-Sync was based on a sound and scientific method of brain entrainment. We designed three studies to measure and investigate the effects of the Hemi-Sync signal on electrocortical activities.

The First Hemi-Sync Pilot Study

Subject and Procedures

The first subject who participated in our Hemi-Sync pilot study was a 20 year-old right-handed white female. She volunteered to participate in the study. The subject had some exposure to tapes containing the Hemi-Sync signal in the past, although she stated that she did not listen to such tapes on a regular basis. During the experiment the subject was seated in a comfortable recliner in a dark room. Gold-plated EEG electrodes of a 16-channel grass EEG model 8-10c were attached using a modified "10-20" system electrode placement. The EEG

unit was then interfaced with the HZI computer system for analysis and dynamic brain mapping.

Method

A simple, single subject reversal design (ABA) was used in this study. In other words, the experiment consisted of three phases: the baseline (A), exposure to Hemi-Sync, or the treatment phase (B), and finally a post-treatment phase similar to that of the baseline phase (A). During the baseline phase the subject's cortical activity was measured while she rested in a recliner. Once the baseline was established, the subject listened to a special Hemi-Sync tape known as Introduction to Focus 10. The subject's EEG was again recorded during this phase. After completing the treatment phase, a post-treatment evaluation of the subject was made while she was merely resting in the recliner.

Results

A close examination of the subject's baseline data showed an asynchronous mixture of Alpha, Theta, and Beta activities. The Beta activity was especially evident in the frontal lobes. The cortical activity during the treatment phase, on the other hand, was completely different. Full phasic hemispheric synchronization was observed across the cortex. The subject's primary brain activity was that of synchronized Theta. The secondary activity was that of synchronized Alpha activity. The results of the treatment phase were quite astonishing since it is rather difficult to achieve and maintain a fully synchronized Theta state. During the post treatment phase, the subject's EEG activity began to resemble that of the baseline phase with one exception: the frontal Beta activity was completely gone. This possibly indicates that a normalization of cortical activity might have had happened due to the treatment (e.g., Hemi-Sync.). The significance and the importance of our findings from this study motivated us to design other similar studies.

The Second Hemi-Sync Study

Subject and Procedures

The subject was a 42 year-old right-handed white male who volunteered to participate in the study. He also had listened to Hemi-Sync tapes in the past but indicated to us that he had not been practicing with such tapes for sometime. Experimental procedures used in this study were exactly similar to those used in the pilot study.

Method

A simple reversal design (ABA) was also used in this study. However, the treatment phase (B) consisted of listening to a different Hemi-Sync tape known as Free Flow 12. This and the Focus 10 tape are standard exercise tapes that are available through The Monroe Institute.

Results

The subject's cortical activity consisted of asynchronous Theta and Alpha waves during the baseline phase. However, a few minutes after the subject began listening to the Focus 12 tape, his cortical activity began to show bilateral synchronous Beta waves. The subject was able to maintain such high power synchronized state while he was listening to the tape. The remarkable shift in brain wave patterns and the phasic synchrony which was induced by the Hemi-Sync signal can be appreciated by examining the strip-chart recordings made during the session. The induction of such a hyper-synchronous state by means of audio signals is indeed unique and virtually unheard of in the literature.

The subject's cortical activity returned to an asynchronous, but a more normalized state during the post-treatment phase. Because of the significant findings of this study, we decided to replicate this study at a later date.

The Third Hemi-Sync Study

During our third study we virtually replicated every condition, procedure, and methodology used in the second study. Again, the same subject's brain wave activity was recorded during the baseline phase (A). He then listened to the Focus 12 tape while his cortical activity was being monitored and recorded (B). Finally, the subject rested while post-treatment recordings were made (B).

The results and findings of this study were virtually identical to those observed in the second study: asynchronous mixture of Theta and Alpha waves during the baseline phase followed by highly synchronized Beta activity across the cortex during the treatment phase. There was also a return to asynchronous Theta/Alpha activity during the post-treatment phase. The only difference between this and the previous study was that it took the subject even less time to produce synchronized brain waves. This may indicate that the more an individual is exposed to the Hemi-Sync signal, the easier it will for him/her to achieve whole-brain integration.

Discussion and Conclusions

It has been documented that each day we experience brief moments of bilateral, phasic hemispheric synchronization. This phenomenon is however quite rare and outside the conscious control of the majority of us. Even certain adept meditators who seem to induce

such a state while meditating, do not appear to have any control over the brain wave frequency at which such synchronization occurs. Furthermore, it may take many years before a serious meditator can achieve full cortical synchrony. Even after years of practice, of course, there are no guarantees that one may experience this unique phenomenon.

Because of the beneficial and therapeutic effects of whole-brain integration, a number of various pieces of equipment, recorded sounds, and technologies are now available which promise and claim to induce such a state. Unfortunately, based on our empirical studies, we have found that none of these approaches seem to even entrain the brain toward a state of synchrony. Thus far, we have been able to document that the only effect technology that indeed results in bilateral hemispheric synchronization is that of the Hemi-Sync signals developed by Robert A. Monroe.

Study after study we have been able to demonstrate that after brief periods of exposure to the Hemi-Sync signal subjects' brain began to enter a state of phasic synchrony. This state appears to be similar to what is cortically experienced by some meditators except for the following exceptions:

First, unlike meditation, Hemi-Sync does not require years of practice. We have been able to demonstrate in our laboratory that after virtually minutes of exposure to the Hemi-Sync signal, full cortical synchrony is achieved.

Second, while the hemispheric synchrony experienced during meditation appears to be limited to a certain range of brain wave frequencies, Hemi-Sync appears to induce a variety of synchronized states at almost any frequency. In other words, the Hemi-Sync signal is capable of facilitating a variety of states of consciousness ranging from deep sleep to focused concentration and beyond.

Finally, after periods of exposure to the Hemi-Sync signal, we have observed that a phenomenon of cortical normalization tends to occur. This beneficial effect appears to be unique to Hemi-Sync since we have not observed anything similar to this with our meditation subjects.

Since we first demonstrated that Hemi-Sync does indeed do what it purports to do, we have continued our experiments with this fascinating brain entrainment modality. We are now documenting some the beneficial effects, both emotional and cognitive, that are induced as a result of moments of brief exposure to Hemi-Sync (see Sadigh, 1991). Studies with larger samples are needed in order to investigate individual differences and how Hemi-Sync may affect specific brain wave activities in different individuals.

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